IDAHO CONTENT STANDARDS
GEOMETRY
MATHEMATICS

       Students are expected to know content and apply skills from Algebra I and prior math courses.

       Mathematical reasoning and problem solving processes will be incorporated throughout all mathematics standards. When solving problems, students should think ahead about a strategy, form conjectures, test ideas with special cases, try different approaches, check for errors and reasonableness of solutions as a regular part of routine work, and devise independent ways to verify results. Students will demonstrate knowledge and communicate mathematical thinking through words, numbers, symbols, charts, graphs, tables, diagrams, and models.

       Maintenance Concepts should have been taught previously and are important foundational concepts that will be applied in this course. Continued facility with and understanding of the Maintenance Concepts is essential for success in the objectives for this course.

       Objectives provide the focus for this course. They will be taught using a variety of methods and applications so that students attain a deep understanding of these concepts and are able to apply them to solve contextual situations.

       Skill Statements are provided when appropriate for clarity and direction to achieve each objective. Students need to demonstrate proficiency in these skills upon completion of this course.

       The appropriate use of technological tools is encouraged to assist students in the formation and testing of conjectures, creating graphs and data displays, and determining and assessing lines of best fit for data.

Standard 1:   Number and Operation

Maintenance Concepts for Standard 1

- Use ratios, including π, and proportions to solve problems.
- Classify real numbers as rational or irrational.
- Distinguish between exact and approximate values of irrational numbers.
- Approximate the location of an irrational number on a number line.
- Use appropriate methods to estimate answers and know if they are reasonable.
- Select a suitable method of computing from mental mathematics, paper and pencil, calculators, or computers.
- Simplify square roots containing radicands which are not perfect squares.
- Find exact and approximate values for square roots.

Goal 1.1: **Understand numbers, ways of representing numbers, relationships among numbers, and number system.**

Objective(s): By the end of Geometry, the student will be able to:

G.1.1.1 Understand the meanings of real numbers.

Skill Statements:
    a. Define and explain the meaning of π.
    b. Recognize π as an irrational number.
    c. Use 3.14 and/or $\dfrac{22}{7}$ as an approximation for π.

Goal 1.2: **Understand meanings of operations and how they relate to one another.**

No objectives at this course level.

Goal 1.3: **Compute fluently and make reasonable estimates.**

Objective(s): By the end of Geometry, the student will be able to:

G.1.3.1 Judge the reasonableness of numerical computations and their results.

Skill Statements:
    a. Use appropriate methods to estimate answers and know if they are reasonable.
    b. Simplify expressions in terms of π.

Suggested Vocabulary and Symbols
π, radical, irrational

Standard 2:   Concepts and Principles of Measurement

Maintenance Concepts for Standard 2

- Understand both metric and customary systems of measurement.
- Understand relationships among units and convert from one unit to another.
- Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.
- Use appropriate methods and units to estimate measurements.
- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.
- Select and use formulas to determine the circumference and area of circles, perimeters and areas of triangles and quadrilaterals.
- Develop strategies to determine the areas of irregular shapes.
- Solve problems involving scale factors, rates, ratios, and proportions.

Goal 2.1:   Understand measurable attributes of objects and the units, systems, and processes of measurement.

Objective(s): By the end of Geometry, the student will be able to:

G.2.1.1   Select appropriate units for problems involving measurement.

Skill Statement:
       a.   Determine appropriate units for distance, angle measure, area, and volume.
       b.   Judge the effects of scale factors on length, area, and volume.

Goal 2.2:   Apply appropriate techniques, tools, and formulas to determine measurements.

Objective(s): By the end of Geometry, the student will be able to:

G.2.2.1   Understand and use formulas to calculate the perimeter, circumference, area, surface area, and volume of geometric figures.

Skill Statements:
       a.   Determine the circumference, area, and area of a sector of a circle.
       b.   Determine the perimeter and area of triangles, parallelograms, and other regular polygons.
       c.   Determine the surface area and volume of prisms, cylinders, pyramids, cones, and spheres.

G.2.2.2   Understand and apply definitions, theorems, corollaries, and postulates to determine measurement.

Skill Statements:
       a.   Apply the segment addition postulate to determine lengths of segments.
       b.   Apply the angle addition postulate to determine the measures of angles.
       c.   Determine the measures of angles in relation to adjacent, complementary, supplementary, vertical, linear pairs, and the special angle pairs formed by parallel lines and transversals.
       d.   Understand and apply the Pythagorean Theorem for problem solving.
       e.   Determine the lengths and measures of arcs of a circle.
       f.   Determine the lengths of segments and measure of angles formed by radii, chords, secants, and tangents of circles.
       g.   Determine the measures of inscribed and central angles and their corresponding intercept arcs.
       h.   Determine the sums of the interior and exterior angles of a polygon.
       i.   Determine the measure of each interior and exterior angle of a regular polygon.

apothem, base of a polygon, cone, circumference, cylinder, diameter, face, lateral area, prism, pyramid, regular polygon, radii, semicircle, sphere, altitude, arc length, axioms, postulates, central angle, chord, common tangent, consecutive interior angles or same side interior angles, corollary, diagonal, exterior angle, interior angle, hemisphere, hypotenuse, inscribed angle, intercepted arc, legs of a right triangle, legs of a trapezoid, linear pair, segment notation, major arc, minor arc, point of tangency, Pythagorean triple, Pythagorean Theorem, secant line, tangent line, secant segment, sector of a circle, vertex

Standard 3:   Concepts and Language of Algebra and Functions

Maintenance Concepts for Standard 3

- Define and interpret relations and functions numerically, graphically, and algebraically.
- Write equations and inequalities to represent data.
- Solve multi-step linear equations and inequalities.
- Add, subtract, and multiply polynomials.
- Divide a polynomial by a monomial.
- Factor polynomials including using greatest common factor.
- Write the equation or inequality in slope-intercept, point-slope, and standard form.
- Graph linear equations.
- Interpret the solution in light of the context.
- Evaluate the equation or inequality for a given value.
- Create a table of values.
- Find and interpret the slope (rate of change) and intercepts in relation to the context.
- Solve linear systems of equations and inequalities involving two variables using multiple strategies.

Goal 3.1:   Understand patterns, relations, and functions.

Objective(s): By the end of Geometry, the student will be able to:

G.3.1.1   Describe the graphs of linear functions and discuss their appearances in terms of the basic concepts of intercepts and rate of change.

Skill Statements:
      a. Given the equation of a line, determine the slopes of the lines parallel and perpendicular to the given line.
      b. Given the equation of a line, graph the lines parallel and perpendicular to it through a given point.

Goal 3.2:   Represent and analyze mathematical situations and structures using algebraic symbols.

Objective(s): By the end of Geometry, the student will be able to:

G.3.2.1   Represent linear patterns and relationships with an equation.

Skill Statements:
      a.   Write equations of parallel and perpendicular lines.

Goal 3.3:   **Use mathematical models to represent and understand quantitative relationships.**

No objectives at this course level.

Goal 3.4:   **Analyze change in various contexts.**

No objectives at this course level.

Standard 4:   Concepts and Principles of Geometry

Maintenance Concepts for Standard 4

- Know and apply algebraic properties (commutative, associative, distributive, inverse, identity, multiplicative property of zero, properties of equality).
- Develop proportional relationships to solve problems.
- Describe and classify relationships among types of one-, two-, and three-dimensional geometric figures using their defining properties.
- Draw and measure various angles and shapes using appropriate tools.

Goal 4.1   **Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.**

Objective(s): By the end of Geometry, the student will be able to:

G.4.1.1   Analyze properties and determine attributes of two- and three-dimensional objects.

Skill Statements:
      a.   Apply the fundamental concepts, properties, and relationships among points, lines, rays, planes, and angles.
      b.   Use accepted geometric notation for lines, planes, segments, rays, angles, similarity and congruence.
      c.   Identify and determine relationships in adjacent, complementary, supplementary, and vertical angles, and in linear pairs.
      d.   Identify and use the special angle pairs formed by parallel lines and a transversal.
      e.   Identify the parts of a circle including radius, diameter, major/minor arcs, chords, secants and tangents.
      f.   Classify angles by their measure (acute, right, obtuse, straight).

     g. Classify triangles by side and angle (acute, right, obtuse, scalene, isosceles, equilateral, equiangular).
     h. Classify quadrilaterals by their attributes (parallelograms, trapezoids, rectangles, rhombi, squares).
     i. Classify polygons by sides and concavity.

G.4.1.2 Explore congruence and similarity among classes of two dimensional objects and solve problems involving them.

Skill Statements:
     a. Identify and apply congruency and similarity in two-dimensional figures.
     b. Identify the scale factor between two similar figures and use it to find missing lengths.
     c. Solve problems involving geometric mean.

G.4.1.3 Establish the validity of geometric conjectures.

Skill Statements:
     a. Construct logical arguments, form conjectures, judge their validity, and give counterexamples to disprove statements.
     b. Informally or formally prove lines are parallel or perpendicular using special angle pair theorems.
     c. Informally or formally prove triangles are congruent using SSS, SAS, ASA and AAS.

Students should see the power of deductive proof in establishing the validity of general results from given conditions. Students should explore ideas, develop conjectures, and test counterexamples in order to effectively produce and present logical arguments with emphasis on careful explanation of the reasoning, rather than on the form of proof used (e.g., paragraph proof or two-column proof).

G.4.1.4 Apply trigonometric relationships to determine lengths and angle measures.

Skill Statements:
     a. Identify and apply special right triangle relationships (30-60-90 and 45-45-90) to determine the lengths of the sides of a triangle.
     b. Relate similarity of right triangles to the trigonometric functions.
     c. Identify sine, cosine and tangent ratios in right triangles and use them to model contextual problems.

Goal 4.2   Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Objective(s): By the end of Geometry, the student will be able to:

G.4.2.1 Use Cartesian coordinates to analyze geometric situations.

Skill Statements:
  a. Determine the midpoint of a segment in the coordinate plane.
  b. Given two endpoints of a segment in a coordinate plane, determine the length of the segment using the distance formula.

Goal 4.3: **Apply transformations and use symmetry to analyze mathematical situations.**

Objective(s): By the end of Geometry, the student will be able to:

G.4.3.1 Understand and represent translations, reflections, dilations, and rotations of objects in the plane.

Skill Statement:
  a. Use transformational geometry to rotate, translate, dilate, and reflect two-dimensional figures.

Goal 4.4: **Use visualization, spatial reasoning, and geometric models to solve problems.**

Objective(s): By the end of Geometry, the student will be able to:

G.4.4.1 Draw and construct representations of two dimensional geometric objects using a variety of tools.

Skill Statement:
  a. Identify and construct medians, altitudes, angle bisectors, and perpendicular bisectors using straightedge and compass.

<u>Suggested Vocabulary and Symbols</u>

acute triangle, adjacent angles, adjacent sides, alternate interior, alternate exterior angles, angle bisector, angle of elevation, angle of depression, axioms, postulates, base angles of an isosceles triangle, base angles of an isosceles trapezoid, bisect, collinear, compass, concave polygon, concentric circles, conclusion, hypothesis, conditional statement, congruent, conjecture, consecutive interior angles or same side interior angles, construction, convex polygon, coplanar, corollary, corresponding angles, cosine, sine, tangent, diagonal, dilation, distance formula, exterior angle, interior angle, geometric mean, image, inductive and deductive reasoning, inscribed polygon, legs of an isosceles triangle, line of reflection, perpendicular, segment notation, major arc, minor arc, median of a triangle, midpoint, midpoint formula, midsegment of a trapezoid, net, parallel, perpendicular bisector, pre-image, reflection, rotation, scale factor, scalene triangle, similar, skew, special right triangles, transformation, translation, transversal, trigonometric ratio, two-column proof, vertex

---

Standard 5:   Data Analysis, Probability, and Statistics

No objectives at this course level.